Ketchikan Beach Monitoring
2020 Field Report
November 23, 2020

Project Summary

The Alaska Beach Monitoring program is part of a nationwide effort to decrease the incidence of water-borne illness at public beaches under the federal Beaches Environmental Assessment and Coastal Health (BEACH) Act. Marine water samples were collected weekly at recreational beaches in Ketchikan to evaluate potential health risks indicated by fecal coliform and enterococci bacteria, and to notify the public when levels exceeded state standards. Nine sites were sampled during the recreational season in 2017, 13 sites in 2018, and 12 sites in 2019 and 2020. Ketchikan beaches are listed in Table 1, and beach locations are shown on Figure 1.

Microbial Source Tracking testing was conducted to identify potential sources of bacteria, however there are no state criteria for comparison. Samples were collected during one sampling event per recreation season (August 2017, 2018 and 2019, September 2020). Human identifiers were detected at all 13 beaches, and dog and gull identifiers were detected at 12 of the 13 beaches[1].

Numerous potential bacteria sources are present along the Ketchikan coast, including private and/or public sewer treatment system outfalls, public sewer treatment system emergency bypass discharges, sewer collection system deficiencies, individual septic tanks, wildlife, pet feces, boats in harbor and launch areas, and private watercraft, ferries, and cruise ships. Data collected to date are not sufficient to determine which bacteria sources are negatively affecting marine water uses at specific beaches.

Table 1: Ketchikan beaches

Ketchikan Area Beaches		
Knudson Cove	South Refuge Cove	Mountain Point Surprise Beach
Beacon Hill	Thomas Basin Harbor	Mountain Point Cultural Food
South Point Higgins Beach	Seaport Beach	Herring Cove
Beach at Shull Road (Shull)	Rotary Park Beach	
Beach off Sunset Cove (Sunset)	Rotary Park Pool	

[1] The MST dog marker was not detected at Mountain Point Surprise Beach, and the MST gull marker was not detected at Mountain Point Cultural Food beach.

Figure 2: Ketchikan beach locations

Results

A comparison of the 2017-2019 data to the 2020 data for enterococci showed approximately half of the monitoring sites with a general decrease, and half showed an increase mixed along the coast[2]. Two thirds of the monitoring sites showed stable or increased fecal coliform levels and one third showed a decrease. Human host identifiers were detected at all 13 beaches, and dog and gull host identifiers were detected at 12 of the 13 beaches for all years.

Several variables that may have influenced 2020 bacteria levels include air and water temperatures, the number of visitors using sanitary facilities in Ketchikan, sewer line improvements and connections to municipal facilities, and the relocation of beach monitoring sites.

Increased air and water temperatures tend to elevate the bacteria levels in water environments, while decreased air and water temperatures and increased precipitation can lower bacteria levels. The summer of 2020 had cooler weather than normal. During usual summertime activities, the 1.1 million visitors[3] using the Ketchikan sanitary facilities may increase bacteria levels in the coastal marine waters, whereas the limited visitors during the 2020 COVID-19 pandemic reduced sanitary facility useage thereby decreasing treated sewer discharge. The City and Borough have made substantial improvements to sewer lines within the downtown area and have connected southern neighborhoods to the Mountain Point sewer treatment facility during the 2018-2019 timeframe. Additionally, the Knudson Cove monitoring site was moved away from a septic marine outfall, to a more heavily used recreation area of the cove.

The 2017-2020 analytical tests for enterococci showed that 12 of the 13 monitoring sites failed to meet the Alaska water quality standard (WQS) statistical threshold value criterion for recreation use, and 10 of the 13 sites failed to meet the Alaska WQS 30-day geometric mean criterion for recreation use during at least one year, and some exceeded the criteria all 4 years.

The 2017-2020 analytical tests for fecal coliform bacteria showed that all 13 of the monitoring sites failed to meet the Alaska WQS single sample criteria for harvesting. Twelve of the 13 sites failed to meet the Alaska WQS geometric mean criterion for harvesting during at least one year, and some exceeded the single sample criteria all 4 years.

Table 3 shows the applicable Alaska WQS used for comparison to marine beach samples. Data was compared against B(i) Water Recreation-contact recreation and Harvesting for (D) Consumption of Raw Mollusks or Other Raw Aquatic Life (membrane filtration test) uses. Tables 4 through 6 provide a summary of analytical results for all monitored beaches for the 2017-2020 recreation seasons.

[2] Elevated and persistent enterococci levels were revealed at the northern locations of South Point Higgins and Sunset, along central areas of Thomas Basin Harbor to the southern locations of Rotary Pool, Mountain Point Cultural Food, and Herring Cove.

[3] 2018 Ketchikan Visitor Bureau statistics

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14), bacteria for marine water uses[2]

Use	Criteria
(A) Water Supply (i) aquaculture	For products normally cooked, the geometric mean of samples taken in a 30-day period may not exceed 200 fecal coliform/100 ml, and not more than 10% of the samples may exceed 400 fecal coliform/100 ml. For products not normally cooked, the geometric mean of samples taken in a 30-day period may not exceed 20 fecal coliform/100 ml, and not more than 10% of the samples may exceed 40 fecal coliform/100 ml.
(A) Water Supply (ii) seafood processing	In a 30-day period, the geometric mean of samples may not exceed 20 fecal coliform/100 ml, and not more than 10% of the samples may exceed 40 fecal coliform/100 ml.
(A) Water Supply (iii) industrial	Where worker contact is present, the geometric mean of samples taken in a 30-day period may not exceed 200 fecal coliform/100 ml, and not more than 10% of the samples may exceed 400 fecal coliform/100 ml.
(B) Water Recreation (i) contact recreation	**In a 30-day period, the geometric mean of samples may not exceed 35 enterococci Colony Forming Unit (CFU)/100 ml, and not more than 10% of the samples may exceed a statistical threshold value (STV) of 130 enterococci CFU/100 ml.**
(B) Water Recreation (ii) secondary recreation	In a 30-day period, the geometric mean of samples may not exceed 200 fecal coliform/100 ml, and not more than 10% of the samples may exceed 400 fecal coliform/100 ml.
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	**The geometric mean of samples may not exceed 14 fecal coliform/100ml; and not more than 10% of the samples may exceed;** - 43 MPN per 100ml for a five-tube decimal dilution test; - 49 MPN per 100ml for a three-tube decimal dilution test; - 28 MPN per 100ml for a twelve-tube single dilution test; **- 31 CFU per 100ml for a membrane filtration test (see note 14[4]).**

[4] Note 14. When fecal coliform are monitored in waters designated as state approved shellfish harvesting and growing waters, these waters are also subject to 18 AAC 34.010(19).

Table 4. Summary of Enterococci Bacteria Results for 2017-2020

Monitoring Locations	Total Samples	Maximum				% Exceedances				Max Geometric Mean			
		2017	2018	2019	2020	2017	2018	2019	2020	2017	2018	2019	2020
Knudson Cove	63	**1986**[1]	**2603**	**369**	97	**22**	**17**	**11**	0	**50**	**54**	**39**	19
Beacon Hill	27	**579**	**183**	--[3]	--	**11**	6	--	--	**45**	21	--	--
South Point Higgins Beach	63	**161**	**410**	130	**2235**	**11**	**33**	0	**17**	**41**	**70**	23	**90**
Beach at Shull Road	63	125	**754**	**727**	**160**	0	**17**	**17**	6	**44**	**49**	**37**	20
Beach at Sunset Drive	63	**248**	**410**	130	**231**	**11**	**33**	0	6	32	**70**	23	**56**
South Refuge Cove	63	**1300**	97	**3448**	41	**11**	0	6	0	33	27	27	13
Thomas Basin Harbor	63	**2420**	**2755**	**1024**	**620**	**33**	**28**	**33**	**11**	**62**	**451**	**133**	**83**
Seaport Beach	63	**250**	52	**173**	**152**	**33**	0	6	6	27	12	9	19
Rotary Park Beach	43	--	10	**269**	**192**	--	0	**11**	6	--	8	**44**	18
Rotary Park Pool	56	**1120**	**1454**	**2851**	**3448**	**44**	**27**	**17**	**28**	**300**	**71**	**71**	**161**
Mountain Point Surprise Beach	43	--	51	**384**	41	--	7	6	0	--	8	22	13
Mountain Point Cultural Food	47	--	**414**	**934**	**144**	--	**18**	**28**	6	--	**43**	**177**	**67**
Herring Cove	53	--	**457**	**2595**	**706**	--	**22**	**33**	**28**	--	**70**	**23**	**167**

[1] Bold red font indicates exceedance of criteria 18AAC70 (14) (B) (i) Contact Recreation – maximum result, over 10% of samples exceedance, and maximum of rolling geometric mean for each recreation year monitored.

[3] '--' not tested, not part of sampling plan that year

Table 5. Summary of Fecal Coliform Bacteria Results for 2017-2020

Monitoring Locations	Total Samples	Maximum				% Exceedances				Geometric Mean			
		2017	2018	2019	2020	2017	2018	2019	2020	2017	2018	2019	2020
Knudson Cove	63	**200**[1]	**144**	**456**	**202**	**33**	**22**	**44**	**33**	**20**	13	**22**	**22**
Beacon Hill	27	**58**	**66**	--[3]	--	**11**	**17**	--	--	10	12	--	--
South Point Higgins Beach	63	**161**	**236**	**187**	**437**	**22**	**39**	**50**	**61**	7	**21**	**35**	**34**
Beach at Shull Road	63	**167**	**132**	**276**	**2001**	**22**	**28**	**39**	**50**	**15**	**20**	**19**	**31**
Beach at Sunset Drive	63	**142**	**93**	**196**	**300**	**33**	**33**	**28**	**28**	**15**	**20**	**21**	**22**
South Refuge Cove	63	**69**	**88**	**184**	**44**	**11**	**33**	**22**	**17**	12	**17**	**15**	9
Thomas Basin Harbor	63	**CG**[2] (>250)	**CG** (>250)	**431**	**324**	**33**	**44**	**61**	**56**	**14**	**28**	**38**	**58**
Seaport Beach	63	**CG** (>250)	**63**	**163**	**152**	**33**	**17**	**22**	**17**	**16**	7	11	11
Rotary Park Beach	43	--	26	**272**	**60**	--	0	**39**	**17**	--	9	**25**	**15**
Rotary Park Pool	56	**200**	**169**	**390**	**CG** (2001)	**33**	**45**	**33**	**56**	**24**	**20**	**20**	**44**
Mountain Point Surprise Beach	43	--	23	**133**	**106**	--	0	**33**	**22**	--	7	**20**	**17**
Mountain Point Cultural Food	47	--	**118**	**526**	**406**	--	**45**	**67**	**39**	--	**17**	**64**	**29**
Herring Cove	54	--	**318**	**386**	**464**	--	**72**	**61**	**78**	--	**47**	**44**	**69**

[1] Bold red font indicates exceedance of criteria 18AAC70 (14) (D) Harvesting – – maximum result, over 10% of samples exceedance, and seasonal geometric mean for each recreation year monitored.

[2] CG – confluent growth. The 2017/2018 data used 250 FC/100 ml as a proxy value for confluent growth. Based on updated studies, 2001 FC/100ml was used for 2019/2020 data.

'--' not tested, not part of sampling plan that year

Table 6. Summary of Microbial Source Tracking (MST) Results for 2017-2020

Monitoring Locations	MST Human				MST Dog				MST Gull			
	2017	2018	2019	2020	2017	2018	2019	2020	2017	2018	2019	2020
Knudson Cove	1380	DNQ	918	1310	--	ND	DNQ	DNQ	--	DNQ	ND	DNQ
Beacon Hill	160	DNQ	--	--	--	DNQ	--	--	--	DNQ	--	--
South Point Higgins	DNQ	2990	DNQ	871	--	991	ND	553	--	DNQ	DNQ	ND
Shull	168	158	DNQ	1020	--	299	ND	DNQ	--	307	3770	1620
Sunset	DNQ	216	DNQ	763	--	1860	ND	553	--	DNQ	ND	ND
South Refuge Cove	153	771	DNQ	630	--	ND	808	DNQ	--	DNQ	ND	DNQ
Thomas Basin	138	287	DNQ	5770	--	359	DNQ	908	DNQ	906	3650	7940
Seaport	1180	DNQ	ND	DNQ	--	DNQ	ND	DNQ	--	7000	1260	ND
Rotary Beach	--	--	1350	DNQ	--	--	DNQ	ND	--	--	ND	DNQ
Rotary Pool	DNQ	DNQ	ND	DNQ	DNQ	37200	DNQ	DNQ	146	2420	ND	DNQ
Mt Point Surprise Beach	--	--	1940	1240	--	--	ND	ND	--	DNQ	ND	DNQ
Mt Point Cultural Food	--	8770	ND	3220	--	DNQ	ND	DNQ	--	--	ND	ND
Herring Cove	--	588	DNQ	ND	--	12	547	ND	--	11900	20200	919

'0000' – quantifiable numeric value
DNQ - detected, not quantified
'--' not available, not tested
ND - non-detect

Next Steps

The DEC Beach program has been working with other DEC programs, the Ketchikan Borough, City of Ketchikan and other stakeholders to collect concurrent samples from various potential pollutant sources in the area. This report and previous ones are available on the Beach website http://beaches.alaska.gov.

During the 2021 recreational season, limited bacteria testing (twice monthly) is planned along with the use of a predictive modeling tool to forecast beach bacteria levels. The testing and modeling will allow DEC to continue providing important information to the public.

In addition, DEC's Alaska Clean Water Actions (ACWA) Grants Program funded a Watershed Management Plan which is designed to address the current pollution sources in Ketchikan and protect high quality waters. The plan will help determine local bacteria pollution sources, support the development of solutions, and the implementation of bacteria source reduction in these areas. The plan follows the Environmental Protection Agency's (EPA) 9-element watershed planning process.

Acknowledgements

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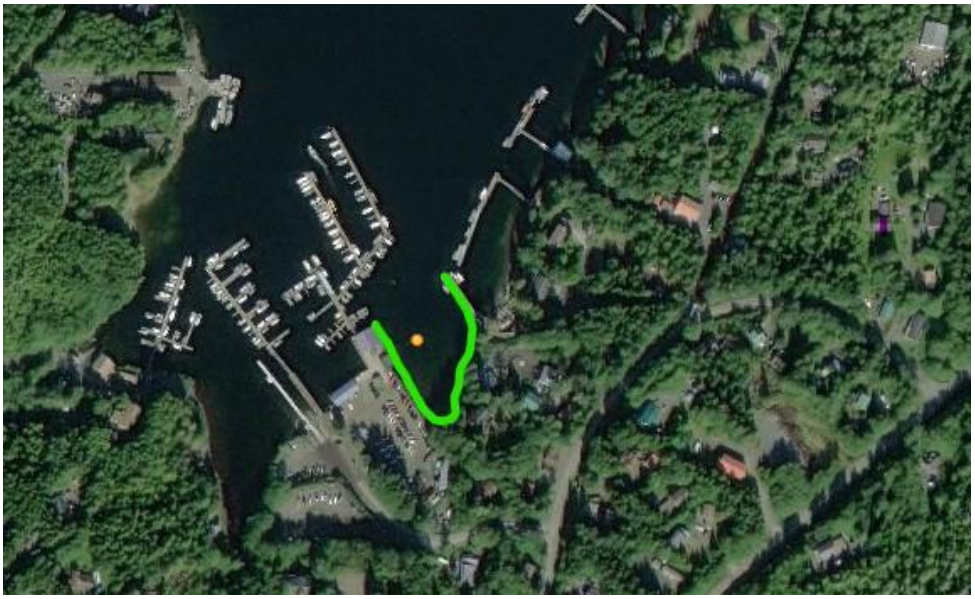
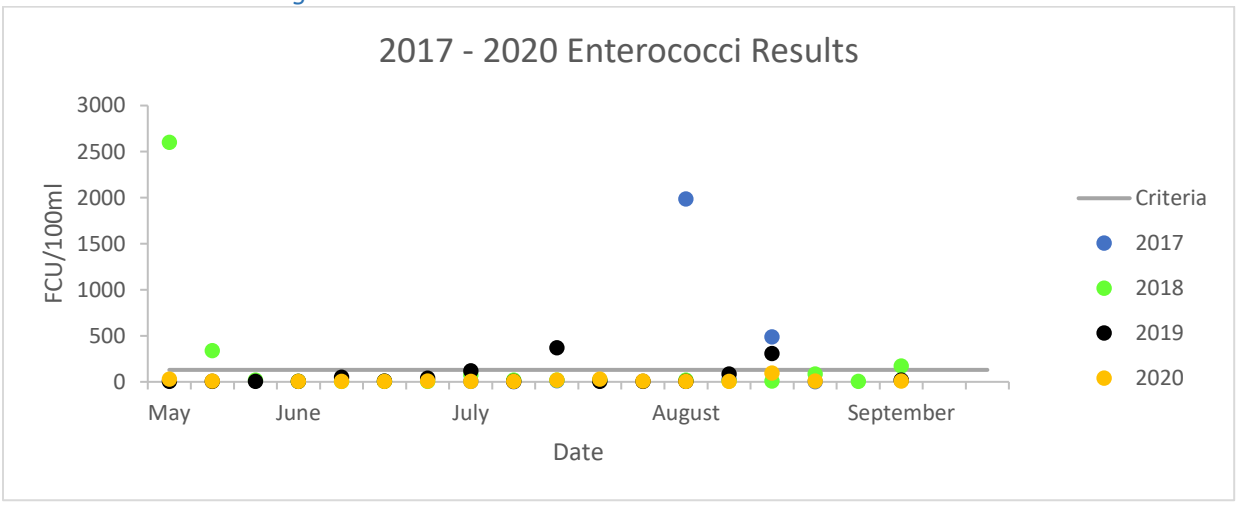
Work was completed in cooperation with EPA, Ketchikan Indian Community, Southeast Alaska Watershed Coalition, several DEC programs (Water Quality Standards, Assessment and Restoration, Compliance, Cruise Ship, and Wastewater Discharge Authorization), the City of Ketchikan, and the Ketchikan Gateway Borough.

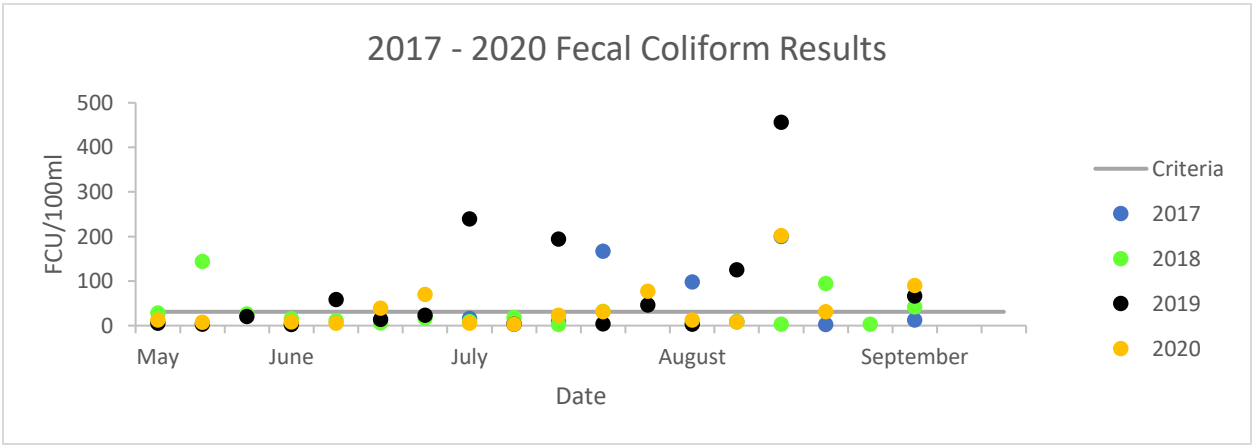
Appendix A – Maps & Graphs

Knudson Cove, Ketchikan, Alaska



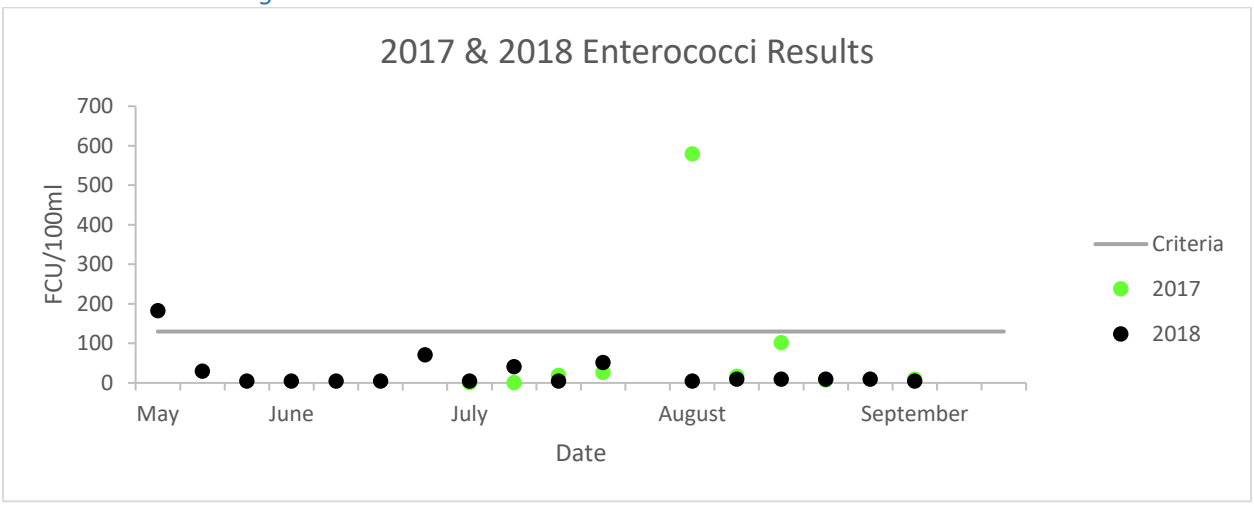
Knudson Cove monitoring site

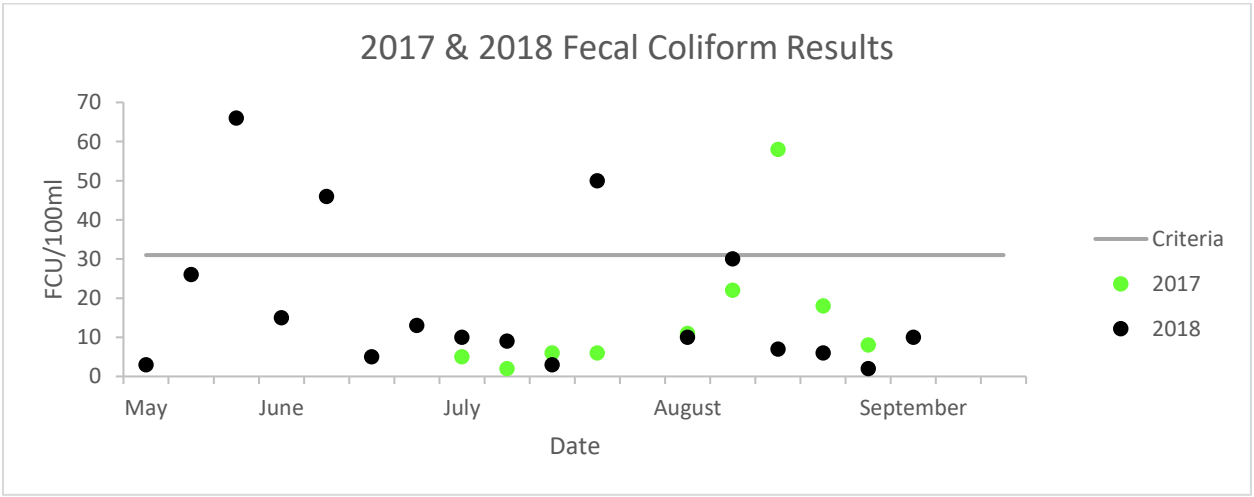




Beacon Hill, Ketchikan, Alaska

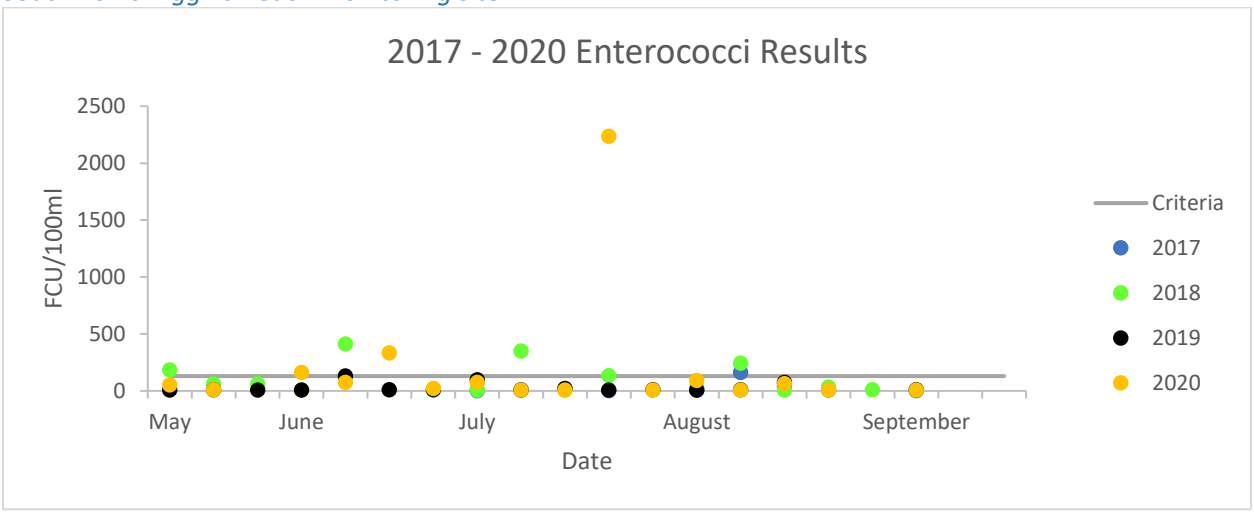
Beacon Hill monitoring site

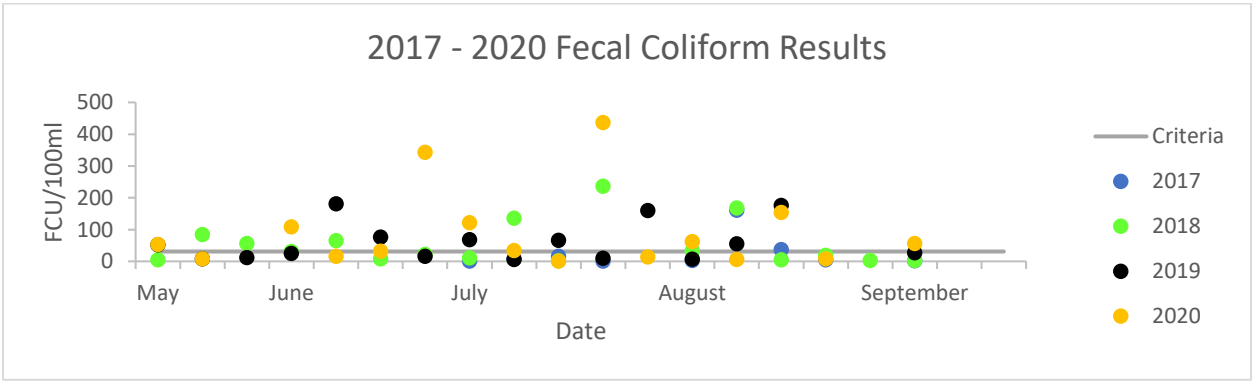




South Point Higgins Beach, Ketchikan, Alaska

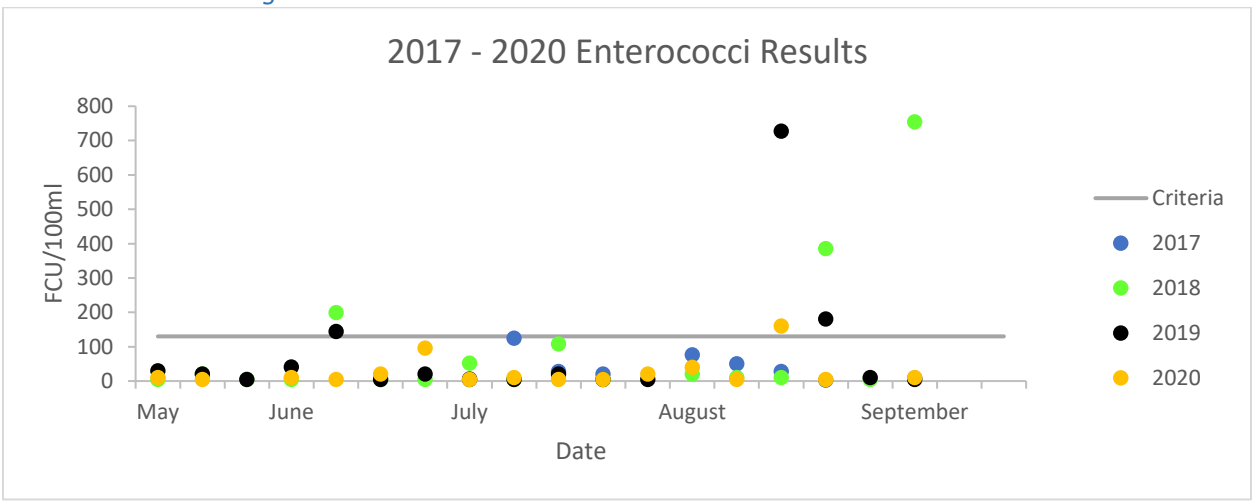
South Point Higgins Beach monitoring site

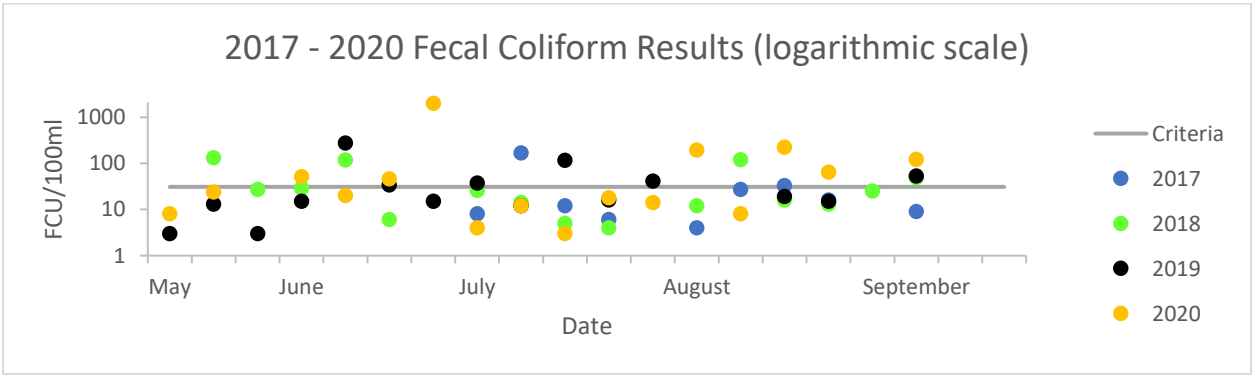




Beach at Shull Road, Ketchikan, Alaska

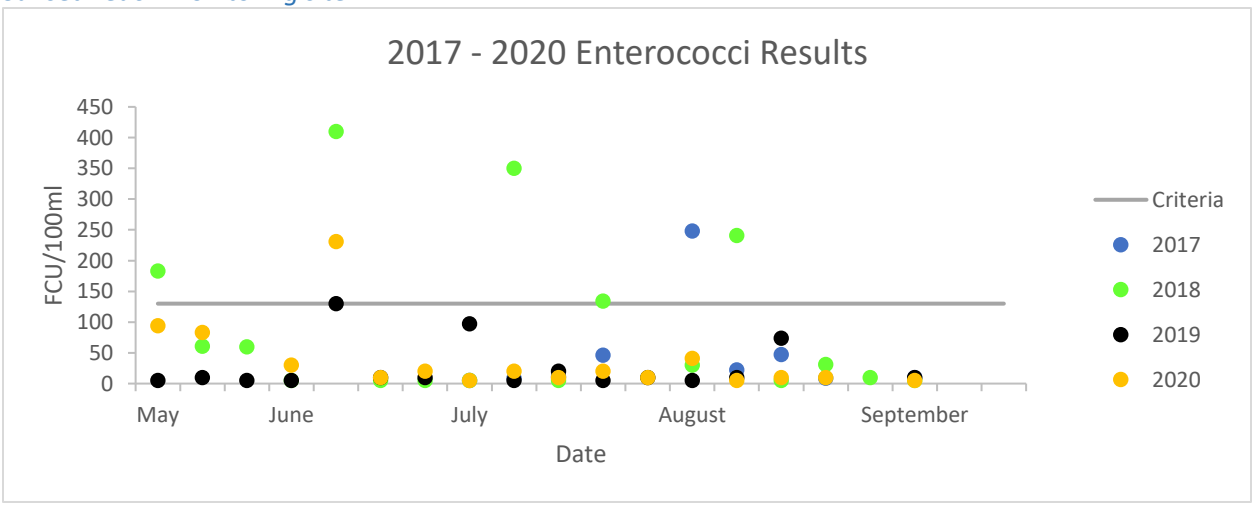
Shull Beach monitoring site

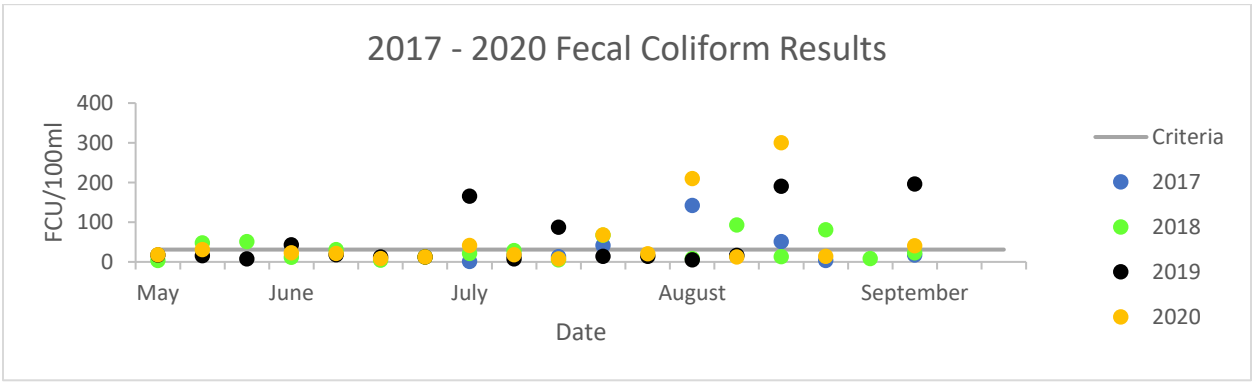




Beach off Sunset Drive, Ketchikan, Alaska

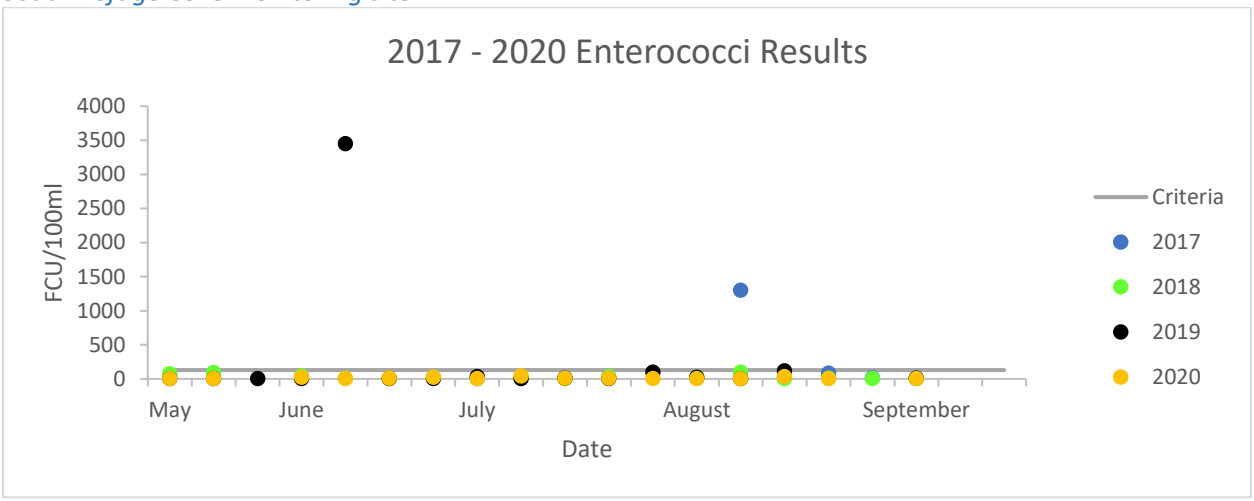
Sunset Beach monitoring site

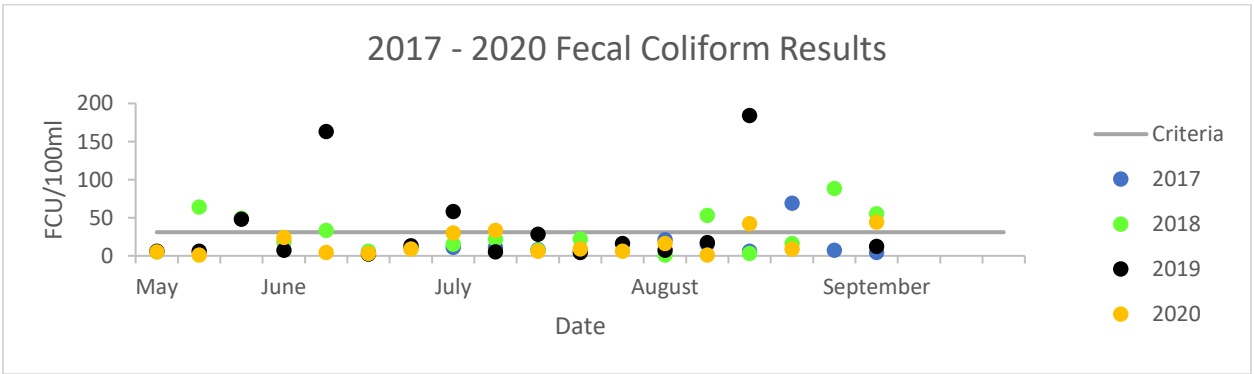




South Refuge Cove, Ketchikan, Alaska

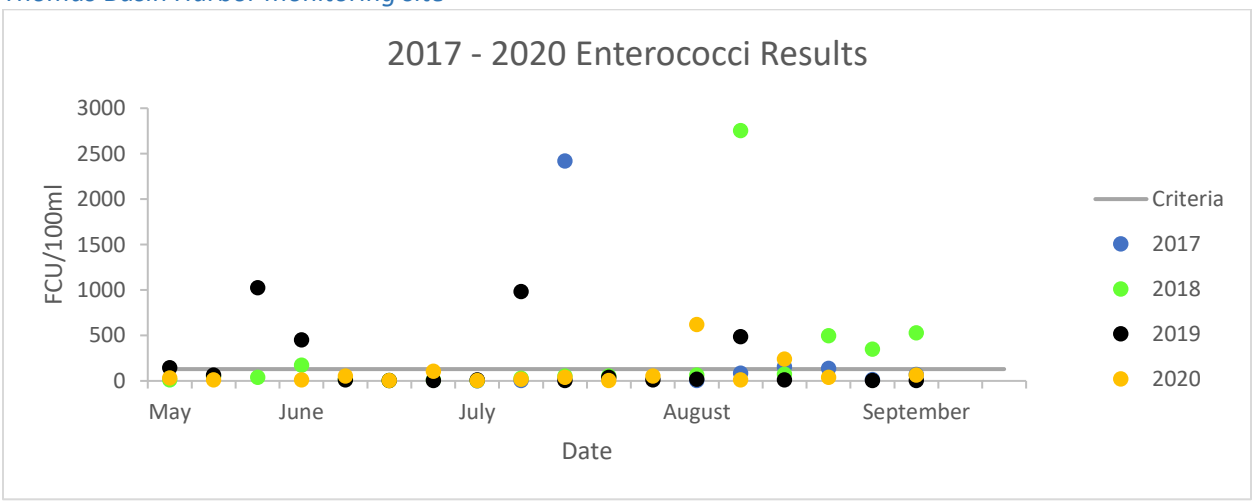
South Refuge Cove monitoring site

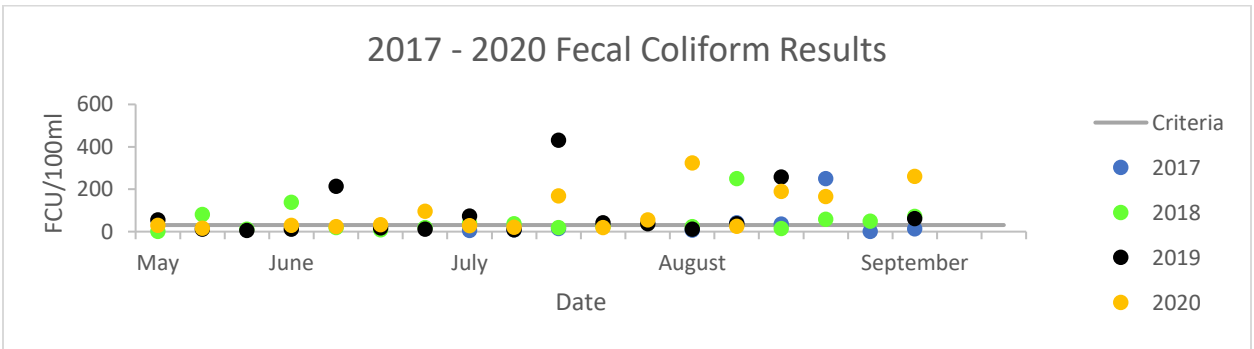




Thomas Basin Harbor, Ketchikan, Alaska

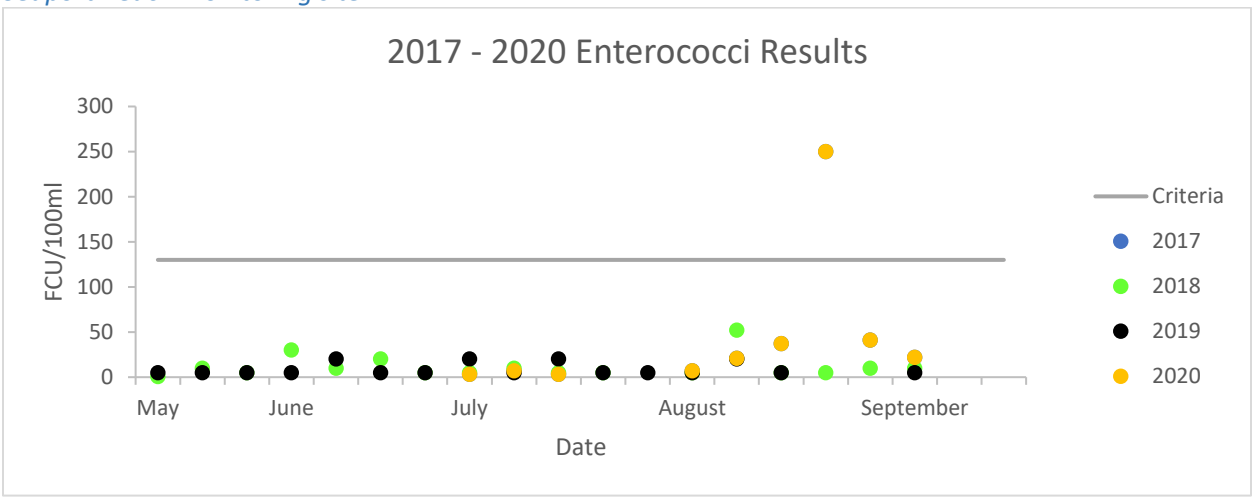
Thomas Basin Harbor monitoring site

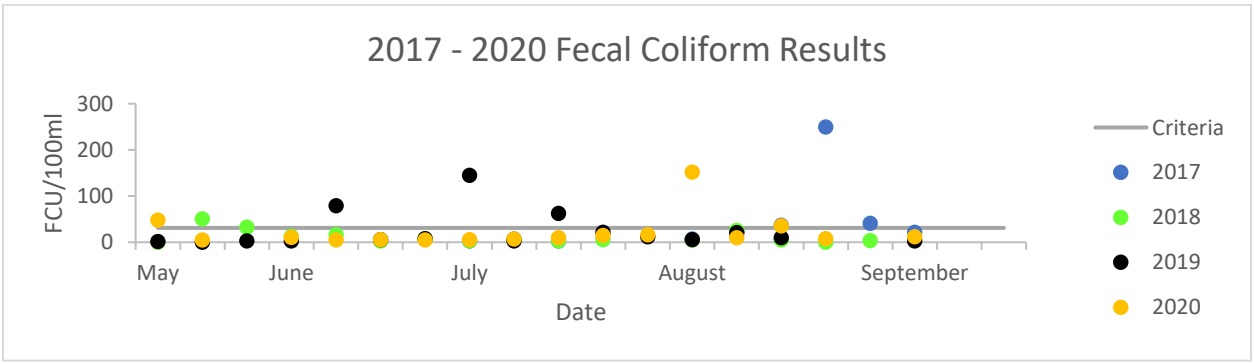




Seaport Beach, Ketchikan, Alaska

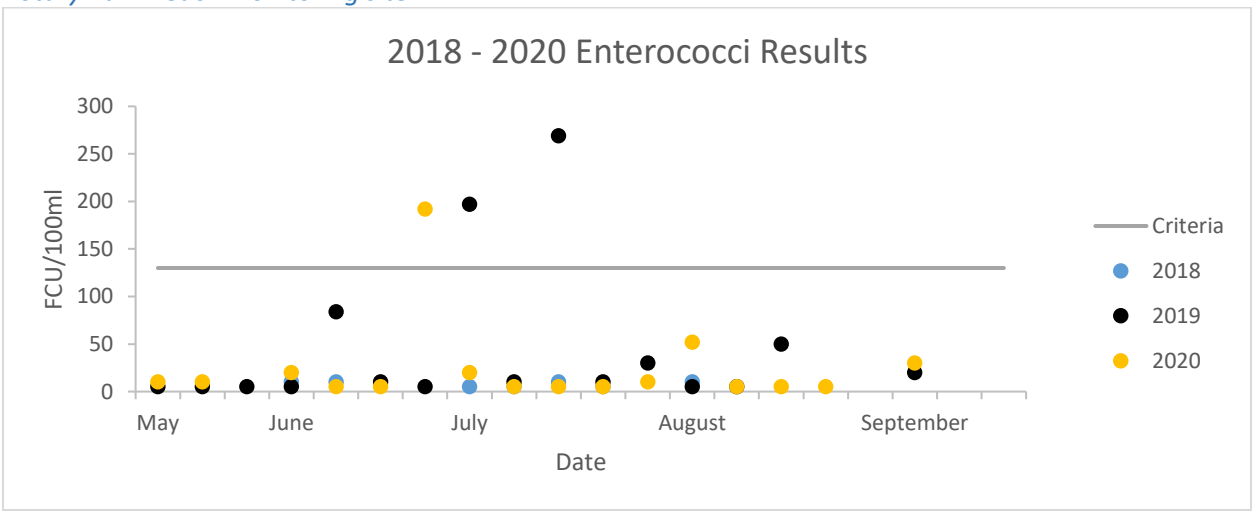
Seaport Beach monitoring site

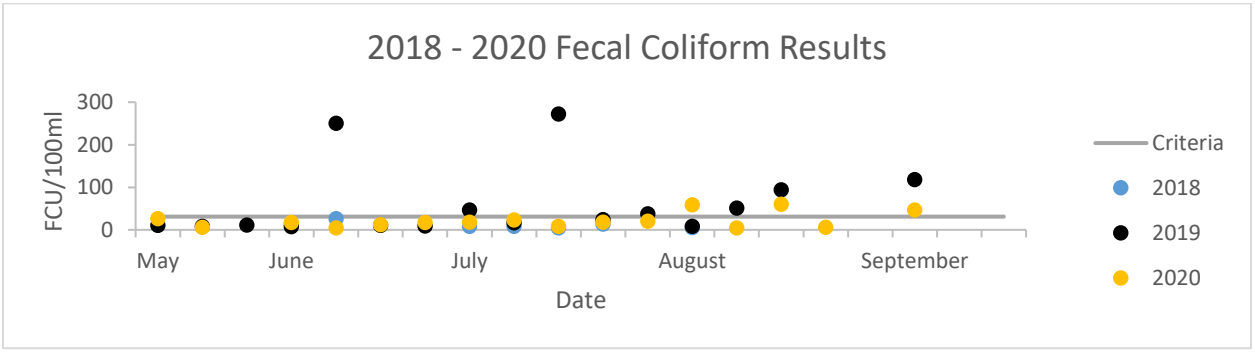




Rotary Park Beach, Ketchikan, Alaska

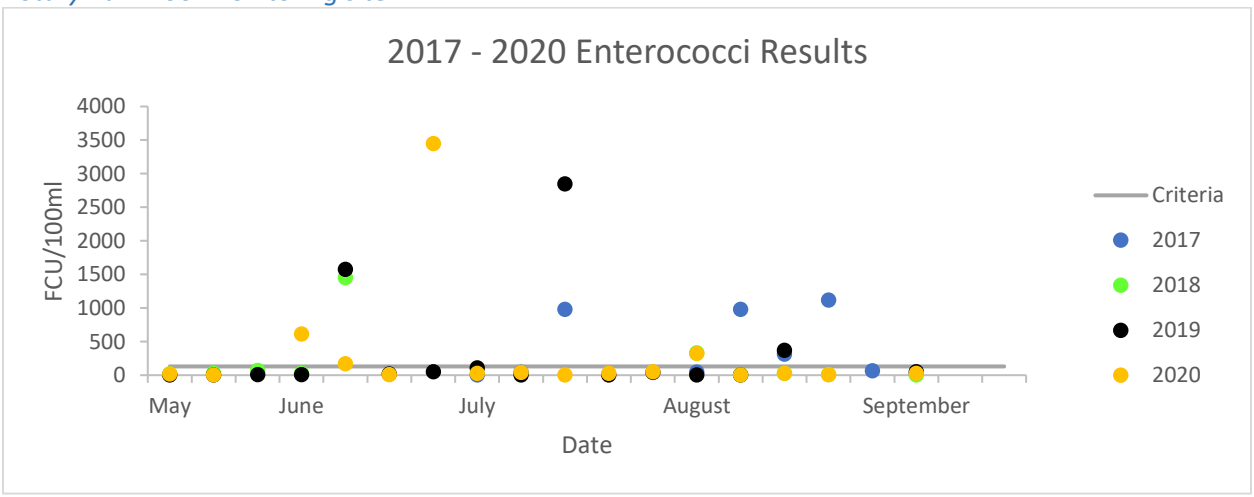
Rotary Park Beach monitoring site

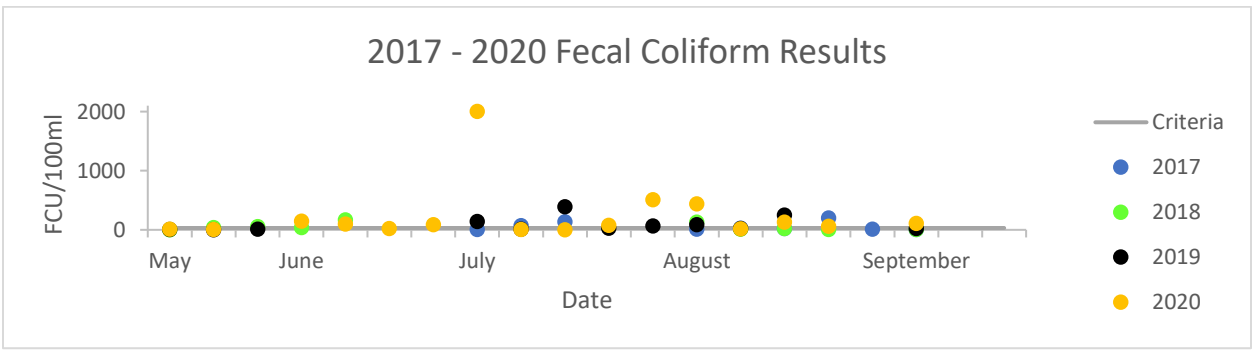




Rotary Park Pool, Ketchikan, Alaska

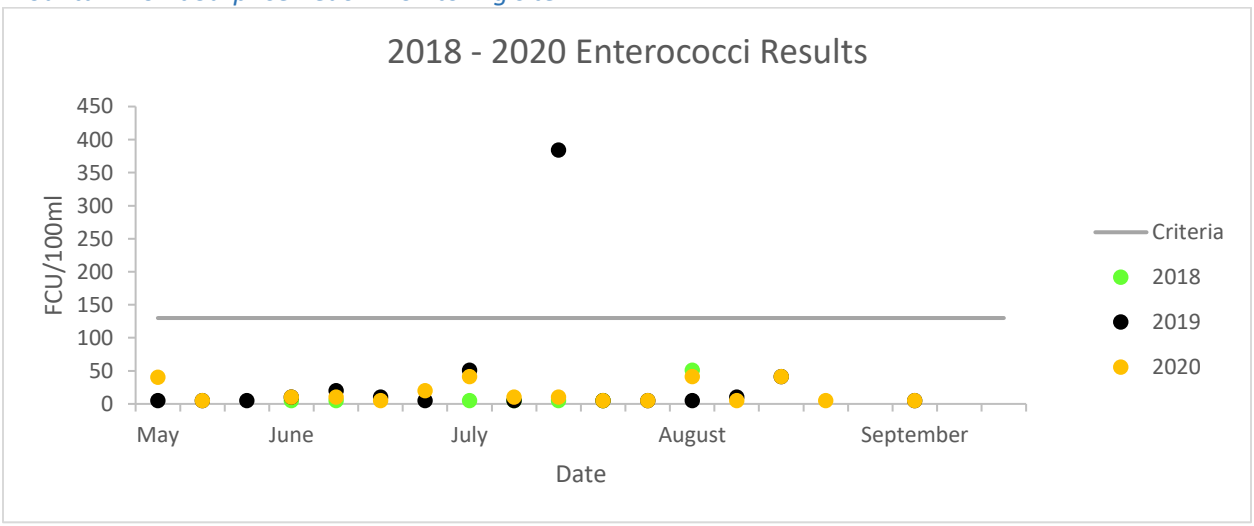
Rotary Park Pool monitoring site

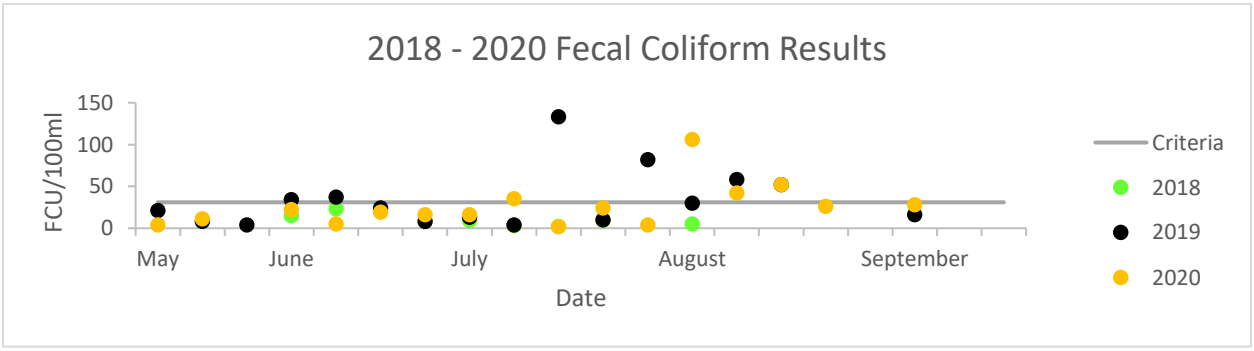




Mountain Point Surprise Beach, Ketchikan, Alaska

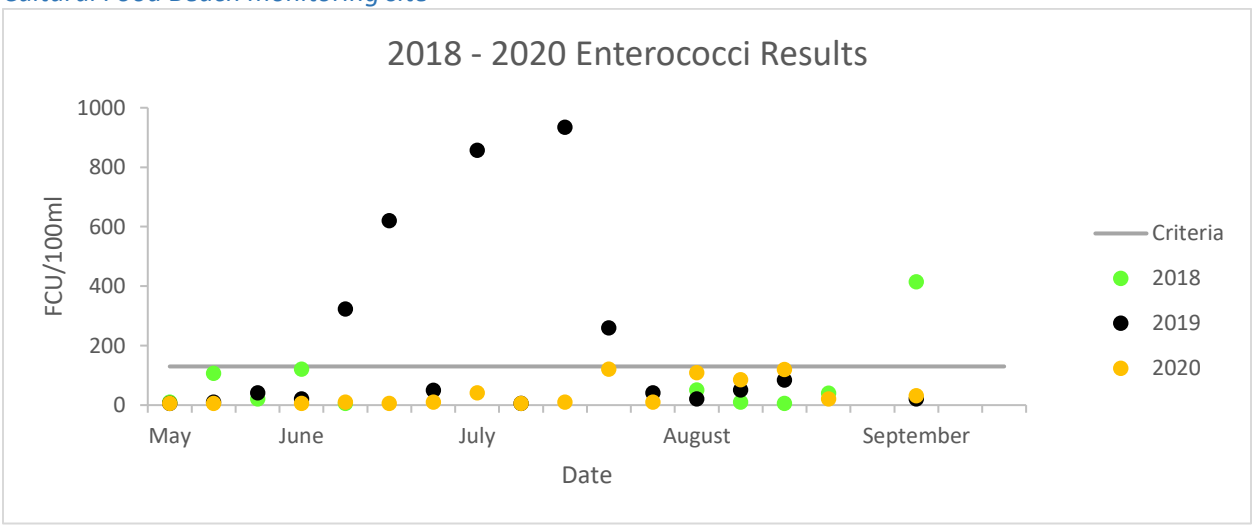
Mountain Point Surprise Beach monitoring site

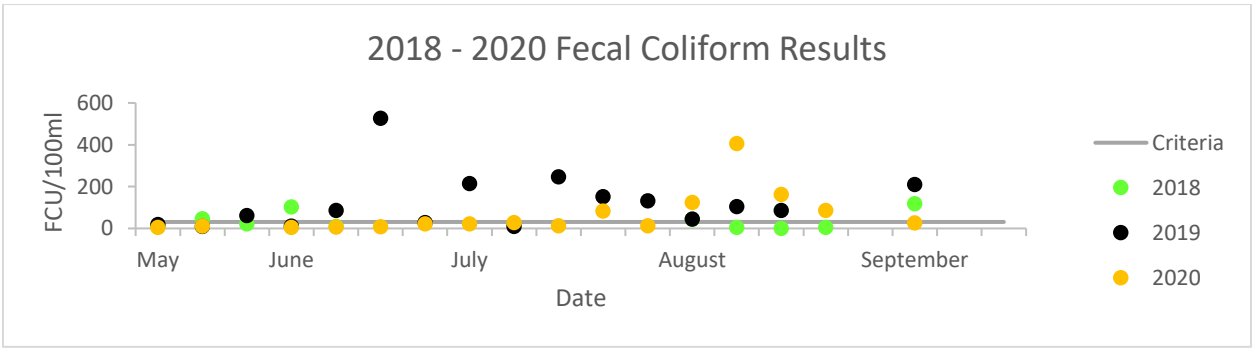




Mountain Point Cultural Food Beach, Ketchikan, Alaska

Cultural Food Beach monitoring site





Herring Cove, Ketchikan, Alaska

Herring Cove monitoring site